AMENDMENT NO. CAL. NO.

[STAFF WORKING DRAFT]

November 10, 2003

Purpose: To authorize appropriations for nanoscience, nanoengineering, and nanotechnology research, and for other purposes.

IN THE SENATE OF THE UNITED STATES—108TH Cong., 1ST Sess.

S. 189, 108TH Congress, 1ST Session

NOVEMBER ——, 2003

( ) Referred to the Committee on ———— and ordered to be printed

( ) Ordered to lie on the table and to be printed

INTENDED to be proposed by Mr. ALLEN (for himself, Mr. WYDEN, Mr. MCCAIN, Mr. STEVENS, and Mr. HOLLINGS).

Viz: Strike out all after the enacting clause and insert the following:

SECTION 1. SHORT TITLE.

This Act may be cited as the ''21st Century Nanotechnology Research and Development Act''.

SEC. 2. NATIONAL NANOTECHNOLOGY PROGRAM.

(a) NATIONAL NANOTECHNOLOGY PROGRAM.—The President shall implement a National Nanotechnology Program. Through appropriate agencies, councils, and the

National Nanotechnology Coordination Office established in section 3, the Program shall—

(1) establish the goals, priorities, and metrics for evaluation for Federal nanotechnology research, development, and other activities;

(2) invest in Federal research and development programs in nanotechnology and related sciences to achieve those goals; and

(3) provide for interagency coordination of Federal nanotechnology research, development, and other activities undertaken pursuant to the Program.

(b) PROGRAM ACTIVITIES.—The activities of the Program shall include—

(1) developing a fundamental understanding of matter that enables control and manipulation at the nanoscale;

(2) providing grants to individual investigators and interdisciplinary teams of investigators;

(3) establishing a network of advanced technology user facilities and centers;

(4) establishing, on a merit-reviewed and competitive basis, interdisciplinary nanotechnology research centers, which shall—

(A) interact and collaborate to foster the exchange of technical information and best practices;

(B) involve academic institutions or national laboratories and other partners, which may include States and industry;

(C) make use of existing expertise in nanotechnology in their regions and nationally;

(D) make use of ongoing research and development at the micrometer scale to support their work in nanotechnology; and

(E) to the greatest extent possible, be established in geographically diverse locations, encourage the participation of Historically Black Colleges and Universities that are part B institutions as defined in section 322(2) of the Higher Education Act of 1965 (20 U.S.C. 1061(2)) and minority institutions (as defined in section 365(3) of that Act (20 U.S.C. 1067k(3))), and include institutions located in States participating in the Experimental Program to Stimulate Competitive Research (EPSCoR);

(5) ensuring United States global leadership in the development and application of nanotechnology;

(6) advancing the United States productivity and industrial competitiveness through stable, consistent, and coordinated investments in long-term scientific and engineering research in nanotechnology;

(7) accelerating the deployment and application of nanotechnology research and development in the private sector, including startup companies;

(8) encouraging interdisciplinary research, and ensuring that processes for solicitation and evaluation of proposals under the Program encourage interdisciplinary projects and collaborations;

(9) providing effective education and training for researchers and professionals skilled in the interdisciplinary perspectives necessary for nanotechnology so that a true interdisciplinary research culture for nanoscale science, engineering, and technology can emerge;

(10) ensuring that ethical, legal, environmental, and other appropriate societal concerns, including the potential use of nanotechnology in enhancing human intelligence and in developing artificial intelligence which exceeds human capacity, are considered during the development of nanotechnology by—

(A) establishing a research program to identify ethical, legal, environmental, and other appropriate societal concerns related to nanotechnology, and ensuring that the results of such research are widely disseminated;

(B) requiring that interdisciplinary nanotechnology research centers established under paragraph (4) include activities that address societal, ethical, and environmental concerns;

(C) insofar as possible, integrating research on societal, ethical, and environmental concerns with nanotechnology research and development, and ensuring that advances in nanotechnology bring about improvements in quality of life for all Americans; and

(D) providing, through the National Nanotechnology Coordination Office established in section 3, for public input and outreach to be integrated into the Program by the convening of regular and ongoing public discussions, through mechanisms such as citizens' panels, consensus conferences, and educational events, as appropriate; and

(11) encouraging research on nanotechnology advances that utilize existing processes and technologies.

(c) PROGRAM MANAGEMENT.—The National Science and Technology Council shall oversee the planning, management, and coordination of the Program. The Council, itself or through an appropriate subgroup it designates or establishes, shall—

(1) establish goals and priorities for the Program, based on national needs for a set of broad applications of nanotechnology;

(2) establish program component areas, with specific priorities and technical goals, that reflect the goals and priorities established for the Program;

(3) oversee interagency coordination of the Program, including with the activities of the Defense Nanotechnology Research and Development Program established under section 246 of the Bob Stump National Defense Authorization Act for Fiscal Year 2003 (Public Law 107-314) and the National Institutes of Health;

(4) develop, within 12 months after the date of enactment of this Act, and update every 3 years thereafter, a strategic plan to guide the activities described under subsection (b), meet the goals, prior-

ities, and anticipated outcomes of the participating agencies, and describe—

(A) how the Program will move results out of the laboratory and into application for the benefit of society;

(B) the Program's support for long-term funding for interdisciplinary research and development in nanotechnology; and

(C) the allocation of funding for interagency nanotechnology projects;

(5) propose a coordinated interagency budget for the Program to the Office of Management and Budget to ensure the maintenance of a balanced nanotechnology research portfolio and an appropriate level of research effort;

(6) exchange information with academic, industry, State and local government (including State and regional nanotechnology programs), and other appropriate groups conducting research on and using nanotechnology;

(7) develop a plan to utilize Federal programs, such as the Small Business Innovation Research Program and the Small Business Technology Transfer Research Program, in support of the activity stated in subsection (b)(7);

(8) identify research areas that are not being adequately addressed by the agencies' current research programs and address such research areas;

(9) encourage progress on Program activities through the utilization of existing manufacturing facilities and industrial infrastructures such as, but not limited to, the employment of underutilized manufacturing facilities in areas of high unemployment as production engineering and research testbeds; and

(10) in carrying out its responsibilities under paragraphs (1) through (9), take into consideration the recommendations of the Advisory Panel, suggestions or recommendations developed pursuant to subsection (b)(10)(D), and the views of academic, State, industry, and other appropriate groups conducting research on and using nanotechnology.

(d) ANNUAL REPORT.—The Council shall prepare an annual report, to be submitted to the Senate Committee on Commerce, Science, and Transportation and the House of Representatives Committee on Science, and other appropriate committees, at the time of the President's budget request to Congress, that includes—

(1) the Program budget, for the current fiscal year, for each agency that participates in the Program, including a breakout of spending for the de-

velopment and acquisition of research facilities and instrumentation, for each program component area, and for all activities pursuant to subsection (b)(10);

(2) the proposed Program budget for the next fiscal year, for each agency that participates in the Program, including a breakout of spending for the development and acquisition of research facilities and instrumentation, for each program component area, and for all activities pursuant to subsection (b)(10);

(3) an analysis of the progress made toward achieving the goals and priorities established for the Program;

(4) an analysis of the extent to which the Program has incorporated the recommendations of the Advisory Panel; and

(5) an assessment of how Federal agencies are implementing the plan described in subsection (c)(7), and a description of the amount of Small Business Innovative Research and Small Business Technology Transfer Research funds supporting the plan.

SEC. 3. PROGRAM COORDINATION.

(a) IN GENERAL.—The President shall establish a National Nanotechnology Coordination Office, with a Director and full-time staff, which shall—

(1) provide technical and administrative support to the Council and the Advisory Panel;

(2) serve as the point of contact on Federal nanotechnology activities for government organizations, academia, industry, professional societies, State nanotechnology programs, interested citizen groups, and others to exchange technical and programmatic information;

(3) conduct public outreach, including dissemination of findings and recommendations of the Advisory Panel, as appropriate; and

(4) promote access to and early application of the technologies, innovations, and expertise derived from Program activities to agency missions and systems across the Federal Government, and to United States industry, including startup companies.

(b) FUNDING.—The National Nanotechnology Coordination Office shall be funded through interagency funding in accordance with section 631 of Public Law 108-7.

(c) REPORT.—Within 90 days after the date of enactment of this Act, the Director of the Office of Science and

Technology Policy shall report to the Senate Committee on Commerce, Science, and Transportation, and the House of Representatives Committee on Science on the funding of the National Nanotechnology Coordination Office. The report shall include—

(1) the amount of funding required to adequately fund the Office;

(2) the adequacy of existing mechanisms to fund this Office; and

(3) the actions taken by the Director to ensure stable funding of this Office.

SEC. 4. ADVISORY PANEL.

(a) IN GENERAL.—The President shall establish or designate a National Nanotechnology Advisory Panel.

(b) QUALIFICATIONS.—The Advisory Panel established or designated by the President under subsection (a) shall consist primarily of members from academic institutions and industry. Members of the Advisory Panel shall be qualified to provide advice and information on nanotechnology research, development, demonstrations, education, technology transfer, commercial application, or societal and ethical concerns. In selecting or designating an Advisory Panel, the President may also seek and give consideration to recommendations from the Congress, industry, the scientific community (including the National

Academy of Sciences, scientific professional societies, and academia), the defense community, State and local governments, regional nanotechnology programs, and other appropriate organizations.

(c) DUTIES.—The Advisory Panel shall advise the President and the Council on matters relating to the Program, including assessing—

(1) trends and developments in nanotechnology science and engineering;

(2) progress made in implementing the Program;

(3) the need to revise the Program;

(4) the balance among the components of the Program, including funding levels for the program component areas;

(5) whether the program component areas, priorities, and technical goals developed by the Council are helping to maintain United States leadership in nanotechnology;

(6) the management, coordination, implementation, and activities of the Program; and

(7) whether societal, ethical, legal, environmental, and workforce concerns are adequately addressed by the Program.

(d) REPORTS.—The Advisory Panel shall report, not less frequently than once every 2 fiscal years, to the President on its assessments under subsection (c) and its recommendations for ways to improve the Program. The first report under this subsection shall be submitted within 1 year after the date of enactment of this Act. The Director of the Office of Science and Technology Policy shall transmit a copy of each report under this subsection to the Senate Committee on Commerce, Science, and Technology, the House of Representatives Committee on Science, and other appropriate committees of the Congress.

(e) TRAVEL EXPENSES OF NON-FEDERAL MEMBERS.—Non-Federal members of the Advisory Panel, while attending meetings of the Advisory Panel or while otherwise serving at the request of the head of the Advisory Panel away from their homes or regular places of business, may be allowed travel expenses, including per diem in lieu of subsistence, as authorized by section 5703 of title 5, United States Code, for individuals in the government serving without pay. Nothing in this subsection shall be construed to prohibit members of the Advisory Panel who are officers or employees of the United States from being allowed travel expenses, including per diem in lieu of subsistence, in accordance with existing law.

(f) EXEMPTION FROM SUNSET.—Section 14 of the Federal Advisory Committee Act shall not apply to the Advisory Panel.

SEC. 5. TRIENNIAL EXTERNAL REVIEW OF THE NATIONAL NANOTECHNOLOGY PROGRAM.

(a) IN GENERAL.—The Director of the National Nanotechnology Coordination Office shall enter into an arrangement with the National Research Council of the National Academy of Sciences to conduct a triennial evaluation of the Program, including—

(1) an evaluation of the technical accomplishments of the Program, including a review of whether the Program has achieved the goals under the metrics established by the Council;

(2) a review of the Program's management and coordination across agencies and disciplines;

(3) a review of the funding levels at each agency for the Program's activities and the ability of each agency to achieve the Program's stated goals with that funding;

(4) an evaluation of the Program's success in transferring technology to the private sector;

(5) an evaluation of whether the Program has been successful in fostering interdisciplinary research and development;

(6) an evaluation of the extent to which the Program has adequately considered ethical, legal, environmental, and other appropriate societal concerns;

(7) recommendations for new or revised Program goals;

(8) recommendations for new research areas, partnerships, coordination and management mechanisms, or programs to be established to achieve the Program's stated goals;

(9) recommendations on policy, program, and budget changes with respect to nanotechnology research and development activities;

(10) recommendations for improved metrics to evaluate the success of the Program in accomplishing its stated goals;

(11) a review of the performance of the National Nanotechnology Coordination Office and its efforts to promote access to and early application of the technologies, innovations, and expertise derived from Program activities to agency missions and systems across the Federal Government and to United States industry;

(12) an analysis of the relative position of the United States compared to other nations with re-

spect to nanotechnology research and development, including the identification of any critical research areas where the United States should be the world leader to best achieve the goals of the Program; and

(13) an analysis of the current impact of nanotechnology on the United States economy and recommendations for increasing its future impact.

(b) STUDY ON MOLECULAR SELF-ASSEMBLY.—As part of the first triennial review conducted in accordance with subsection (a), the National Research Council shall conduct a one-time study to determine the technical feasibility of molecular self-assembly for the manufacture of materials and devices at the molecular scale.

(c) STUDY ON THE RESPONSIBLE DEVELOPMENT OF NANOTECHNOLOGY.—As part of the first triennial review conducted in accordance with subsection (a), the National Research Council shall conduct a one-time study to assess the need for standards, guidelines, or strategies for ensuring the responsible development of nanotechnolgy, including, but not limited to—

(1) self-replicating nanoscale machines or devices;

(2) the release of such machines in natural environments;

(3) encryption;

(4) the development of defensive technologies;

(5) the use of nanotechnology in the enhancement of human intelligence; and

(6) the use of nanotechnology in developing artificial intelligence.

(d) EVALUATION TO BE TRANSMITTED TO CONGRESS.—The Director of the National Nanotechnology Coordination Office shall transmit the results of any evaluation for which it made arrangements under subsection (a) to the Advisory Panel, the Senate Committee on Commerce, Science, and Transportation and the House of Representatives Committee on Science upon receipt. The first such evaluation shall be transmitted no later than June 10, 2005, with subsequent evaluations transmitted to the Committees every 3 years thereafter.

SEC. 6. AUTHORIZATION OF APPROPRIATIONS.

(a) NATIONAL SCIENCE FOUNDATION.—There are authorized to be appropriated to the Director of the National Science Foundation to carry out the Director's responsibilities under this Act—

(1) $385,000,000 for fiscal year 2005;

(2) $424,000,000 for fiscal year 2006;

(3) $449,000,000 for fiscal year 2007; and

(4) $476,000,000 for fiscal year 2008.

(b) DEPARTMENT OF ENERGY.—There are authorized to be appropriated to the Secretary of Energy to carry out the Secretary's responsibilities under this Act—

(1) $317,000,000 for fiscal year 2005;

(2) $347,000,000 for fiscal year 2006;

(3) $380,000,000 for fiscal year 2007; and

(4) $415,000,000 for fiscal year 2008.

(c) NATIONAL AERONAUTICS AND SPACE ADMINISTRATION.—There are authorized to be appropriated to the Administrator of the National Aeronautics and Space Administration to carry out the Administrator's responsibilities under this Act—

(1) $34,100,000 for fiscal year 2005;

(2) $37,500,000 for fiscal year 2006;

(3) $40,000,000 for fiscal year 2007; and

(4) $42,300,000 for fiscal year 2008.

(d) NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY.—There are authorized to be appropriated to the Director of the National Institute of Standards and Technology to carry out the Director's responsibilities under this Act—

(1) $68,200,000 for fiscal year 2005;

(2) $75,000,000 for fiscal year 2006;

(3) $80,000,000 for fiscal year 2007; and

(4) $84,000,000 for fiscal year 2008.

(e) ENVIRONMENTAL PROTECTION AGENCY.—There are authorized to be appropriated to the Administrator of the Environmental Protection Agency to carry out the Administrator's responsibilities under this Act—

(1) $5,500,000 for fiscal year 2005;

(2) $6,050,000 for fiscal year 2006;

(3) $6,413,000 for fiscal year 2007; and

(4) $6,800,000 for fiscal year 2008.

SEC. 7. DEPARTMENT OF COMMERCE PROGRAMS.

(a) NIST PROGRAMS.—The Director of the National Institute of Standards and Technology shall—

(1) as part of the Program activities under section 2(b)(7), establish a program to conduct basic research on issues related to the development and manufacture of nanotechnology, including metrology; reliability and quality assurance; processes control; and manufacturing best practices; and

(2) utilize the Manufacturing Extension Partnership program to the extent possible to ensure that the research conducted under paragraph (1) reaches small- and medium-sized manufacturing companies.

(b) CLEARINGHOUSE.—The Secretary of Commerce or his designee, in consultation with the National Nanotechnology Coordination Office and, to the extent

possible, utilizing resources at the National Technical Information Service, shall establish a clearinghouse of information related to commercialization of nanotechnology research, including information relating to activities by regional, State, and local commercial nanotechnology initiatives; transition of research, technologies, and concepts from Federal nanotechnology research and development programs into commercial and military products; best practices by government, universities and private sector laboratories transitioning technology to commercial use; examples of ways to overcome barriers and challenges to technology deployment; and use of manufacturing infrastructure and workforce.

SEC. 8. DEPARTMENT OF ENERGY PROGRAMS.

(a) RESEARCH CONSORTIA.—

(1) DEPARTMENT OF ENERGY PROGRAM.—The Secretary of Energy shall establish a program to support, on a merit-reviewed and competitive basis, consortia to conduct interdisciplinary nanotechnology research and development designed to integrate newly developed nanotechnology and microfluidic tools with systems biology and molecular imaging.

(2) AUTHORIZATION OF APPROPRIATIONS.—Of the sums authorized for the Department of Energy under section 6(b), $25,000,000 shall be used for

each fiscal year 2005 through 2008 to carry out this section. Of these amounts, not less than $10,000,000 shall be provided to at least 1 consortium for each fiscal year.

(b) RESEARCH CENTERS AND MAJOR INSTRUMENTATION.—The Secretary of Energy shall carry out projects to develop, plan, construct, acquire, operate, or support special equipment, instrumentation, or facilities for investigators conducting research and development in nanotechnology.

SEC. 9. ADDITIONAL CENTERS.

(a) AMERICAN NANOTECHNOLOGY PREPAREDNESS CENTER.—The Program shall provide for the establishment, on a merit-reviewed and competitive basis, of an American Nanotechnology Preparedness Center which shall—

(1) conduct, coordinate, collect, and disseminate studies on the societal, ethical, environmental, educational, legal, and workforce implications of nanotechnology; and

(2) identify anticipated issues related to the responsible research, development, and application of nanotechnology, as well as provide recommendations for preventing or addressing such issues.

(b) CENTER FOR NANOMATERIALS MANUFACTURING.—The Program shall provide for the establishment, on a merit reviewed and competitive basis, of a center to—

(1) encourage, conduct, coordinate, commission, collect, and disseminate research on new manufacturing technologies for materials, devices, and systems with new combinations of characteristics, such as, but not limited to, strength, toughness, density, conductivity, flame resistance, and membrane separation characteristics; and

(2) develop mechanisms to transfer such manufacturing technologies to United States industries.

(c) REPORTS.—The Council, through the Director of the National Nanotechnology Coordination Office, shall submit to the Senate Committee on Commerce, Science, and Transportation and the House of Representatives Committee on Science—

(1) within 6 months after the date of enactment of this Act, a report identifying which agency shall be the lead agency and which other agencies, if any, will be responsible for establishing the Centers described in this section; and

(2) within 18 months after the date of enactment of this Act, a report describing how the Centers described in this section have been established.

SEC. 10. DEFINITIONS.

In this Act:

(1) ADVISORY PANEL.—The term ''Advisory Panel'' means the President's National Nanotechnology Advisory Panel established or designated under section 4.

(2) NANOTECHNOLOGY.—The term ''nanotechnology'' means the science and technology that will enable one to understand, measure, manipulate, and manufacture at the atomic, molecular, and supramolecular levels, aimed at creating materials, devices, and systems with fundamentally new molecular organization, properties, and functions.

(3) PROGRAM.—The term ''Program'' means the National Nanotechnology Program established under section 2.

(4) COUNCIL.—The term ''Council'' means the National Science and Technology Council or an appropriate subgroup designated by the Council under section 2(c).

(5) ADVANCED TECHNOLOGY USER FACILITY.—The term ''advanced technology user facility'' means

a nanotechnology research and development facility supported, in whole or in part, by Federal funds that is open to all United States researchers on a competitive, merit-reviewed basis.

(6) PROGRAM COMPONENT AREA.—The term ''program component area'' means a major subject area established under section 2(c)(2) under which is grouped related individual projects and activities carried out under the Program.

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